

WHAT IS CLAIMED IS:

- 1 1. A Digital Focus Lens System for providing an optical system having a plurality of
2 selectable focal powers, comprising:
3 a first switchable element capable of being switched between a first-element first-state
4 and a first-element second-state; and
5 and a second switchable element capable of being switched between a second-element
6 first-state and a second-element second-state;
7 wherein the first and second switchable elements are in optical communication with
8 each other such that each of them may contribute to a cumulative focal power,
9 wherein, a first focal power may be selected by activation of the first switchable
10 element to the first-element first-state and activation of the second switchable element
11 to the second-element first-state,
12 wherein a second focal power is selected by activation of the first switchable element
13 to the first-element second-state and activation of the second switchable element to
14 the second-element first-state,
15 wherein a third focal power is selected by activation of the first switchable element to
16 the first-element first-state and activation of the second switchable element to the
17 second-element second-state, and
18 wherein a fourth focal power is selected by activation of the first switchable element
19 to the first-element second-state and activation of the second switchable element to
20 the second-element second-state..
- 1 2. The system according to Claim 1 wherein a portion of the switchable elements
2 include liquid crystal lenses.
- 1 3. The system according to Claim 1 wherein a portion of the switchable elements
2 include switchable holographic optical elements.
- 3 4. The system according to Claim 1 wherein a portion of the switchable elements
4 include polymer dispersed liquid crystal.
- 5 5. The system according to Claim 1 wherein a portion of the switchable elements
6 form a lens stack..

- 1 6. The system according to Claim 1 further comprising one or more non-switchable
2 elements for further modifying the optical properties of the system.
- 1 7. The system according to Claim 1 further comprising any number of additional
2 switchable elements.
- 1 8. The system according to Claim 1 wherein a portion of the switchable elements
2 include electro-optic lenses.
- 3 9. The system according to Claim 1 wherein a portion of the switchable elements
4 include liquid crystal and polymer lenses.
- 1 10. The system of claim 1 wherein the digital focus lens system is a digital telescope,
2 telephoto lens, or zoom lens.
- 1 11. The system of claim 1 wherein the digital focus lens system is a digital camera.
- 1 12. The system of claim 1 wherein the digital focus lens system is a digital projector.
- 1 13. The system of claim 1 wherein the digital focus lens system is a digital
2 microscope.
- 3 14. The system of claim 1 further comprising a controller for providing control signals
4 that serve to activate the first and second switchable elements.
- 1 15. The system according to Claim 1 wherein a portion of the switchable elements
2 may be continuously tuned between the focal powers of their respective first- and
3 second- states.
- 4 16. The system of claim 1 further comprising one or more light sources for providing
5 light to be transmitted through and modified by the system.
- 6 17. The system of claim 16 wherein the light is received and transmitted by the first
7 and second switchable elements and is modified in accordance with the selected
8 focal powers of the first and second switchable elements.
- 1 18. The system of claim 17 wherein a portion of the light transmitted by the system
2 forms one or more images.

1 19. A method for fabricating a switchable element, comprising:

2 providing a structure having a conductive layer disposed between a substrate and a lens

3 function layer;

4 providing a die substrate with a spatially varying thickness pattern;

5 while the lens function layer is in a soft or viscous state, bringing the die surface into

6 contact with the lens function layer;

7 hardening the lens function layer; and

1 20. The method of claim 19, further comprising attaching a second lens function layer to a

2 surface of the substrate and, while the second lens function layer is in a soft or viscous

3 state, bringing a die surface with a varying thickness pattern into contact with the

4 second lens function layer, hardening the second lens function layer and separating the

5 die surface from the second lens function layer.

1 21. A method for controlling a digital lens system having N switchable elements in optical

2 communication with each other such that each of them may contribute to a cumulative

3 focal power, where N is 1 or more, wherein each switchable element is capable of being

4 switched between a first-state and a second-state, the method comprising:

5 generating a control signal containing information for controlling the states of each of the

6 N switchable elements; and

7 coupling the control signal to the N switchable elements to set the state of each of the N

8 switchable elements,

9 and wherein a portion of the control signal includes a data stream comprising a control

10 word.

1 22. The method of claim 21 wherein the control word is a digital word having a bit field

2 length of N bits.

23. The method of claim 19 wherein the control signal is an electrical signal.

24. The method of claim 23 wherein the control signal is at a voltage, current or

frequency appropriate for activating the switchable elements to their desired states.